

Ecological impacts of woody biomass harvesting on aspen ecosystems



MFRC Meeting
November 30, 2011

Project Background

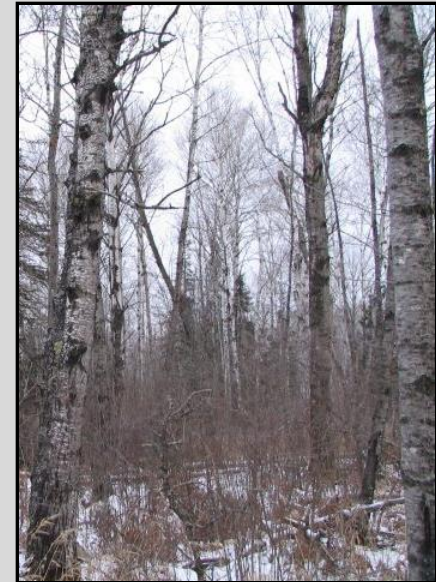
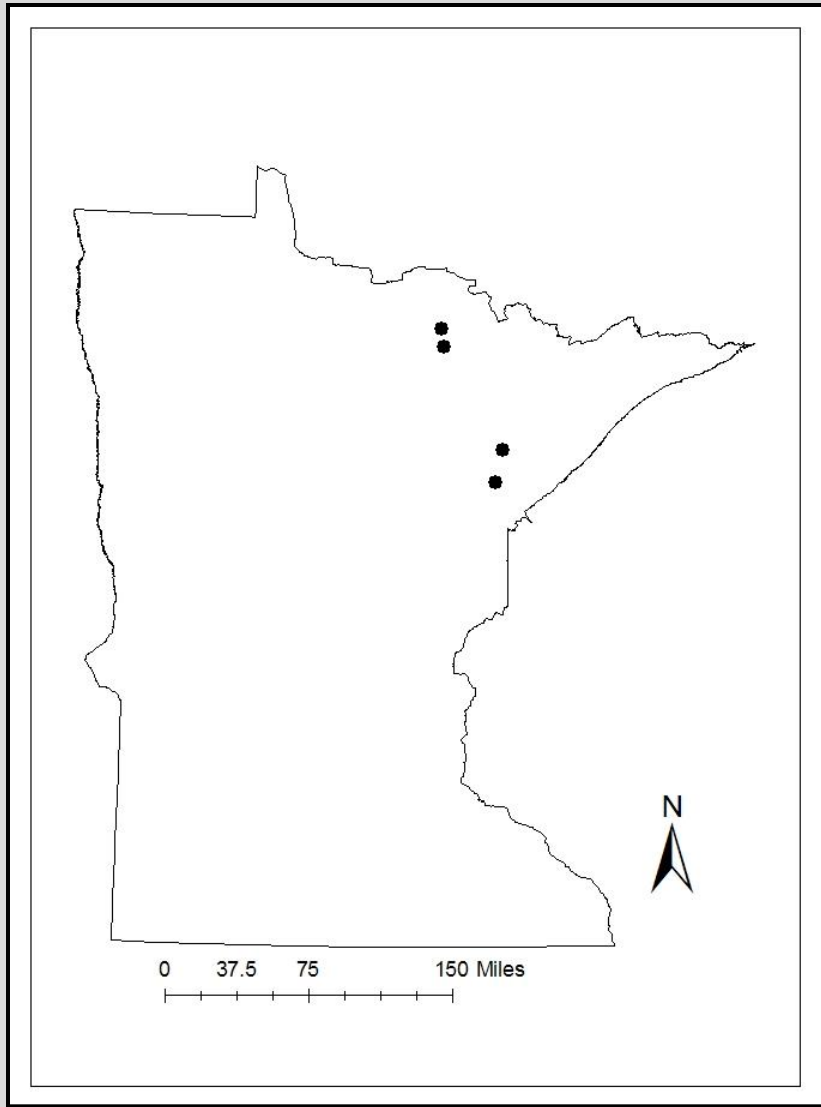
- Developed in response to concerns regarding ecological impacts of increased woody biomass removals on Minnesota's forests
- Funded in September 2008 by MFRC pass-through grant from BWSR



Research Questions

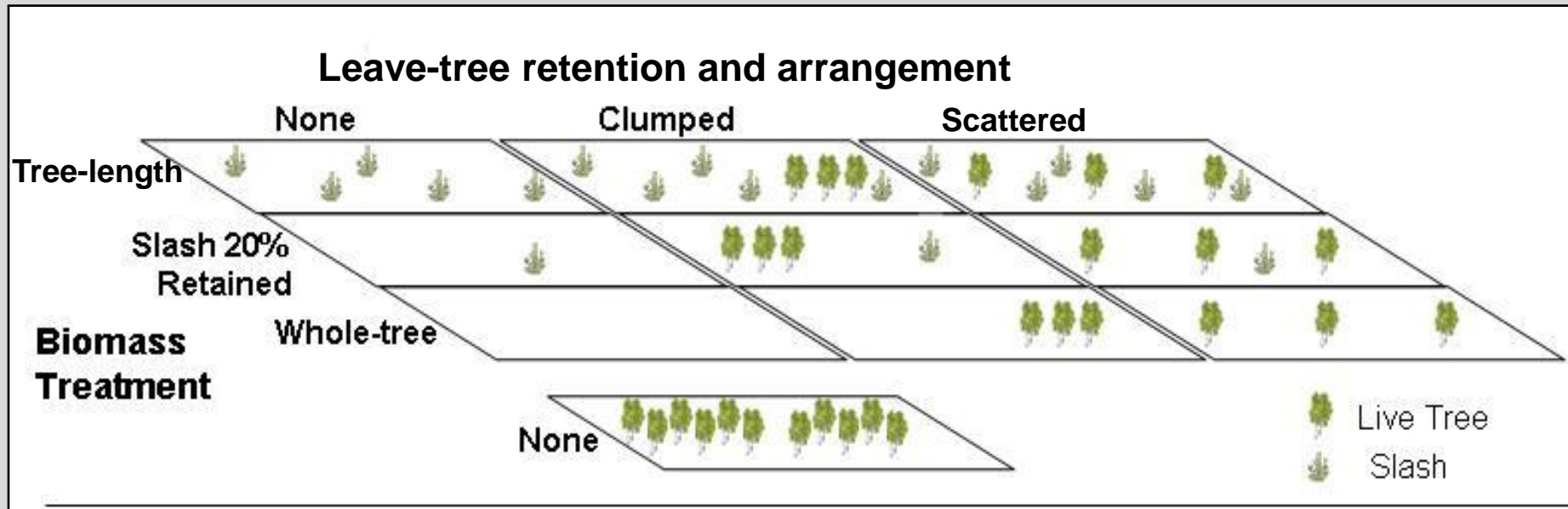
1. Do different levels of woody biomass harvesting have long-term effects on saproxylic animal and fungal communities, forest regeneration & productivity, nutrient availability, & carbon storage?
2. To what extent does retention of leave trees and harvesting residues ameliorate the impacts of biomass harvesting?

Study Design



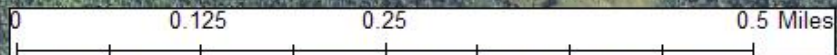
2 sites on DNR and St. Louis County Lands, respectively

Study Design




- Each treatment plot is **10 acres**
- Each study area encompasses at least **120 acres**
- Aspen-dominated stands (60-70 yrs old)
 - **Nutrient rich sites (MHn44)**
- Conventional harvesting (Winter 2009/10)
- 20% slash retention and leave-tree levels based on MFRC Guidelines

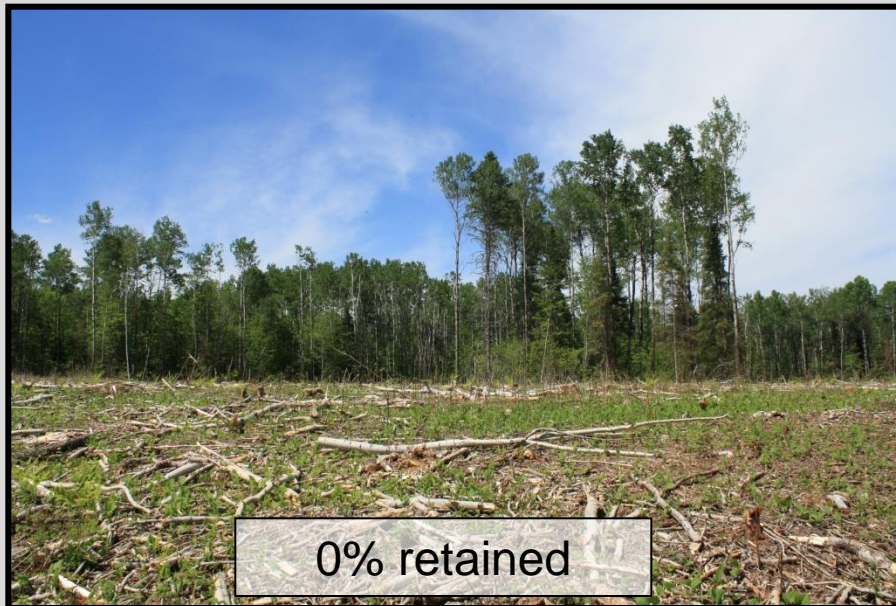
Photo Credit: Chris Smith



Independence Site

 Treatment Boundaries

Treatment implementation



Slash retention

Treatment implementation



Aggregate retention

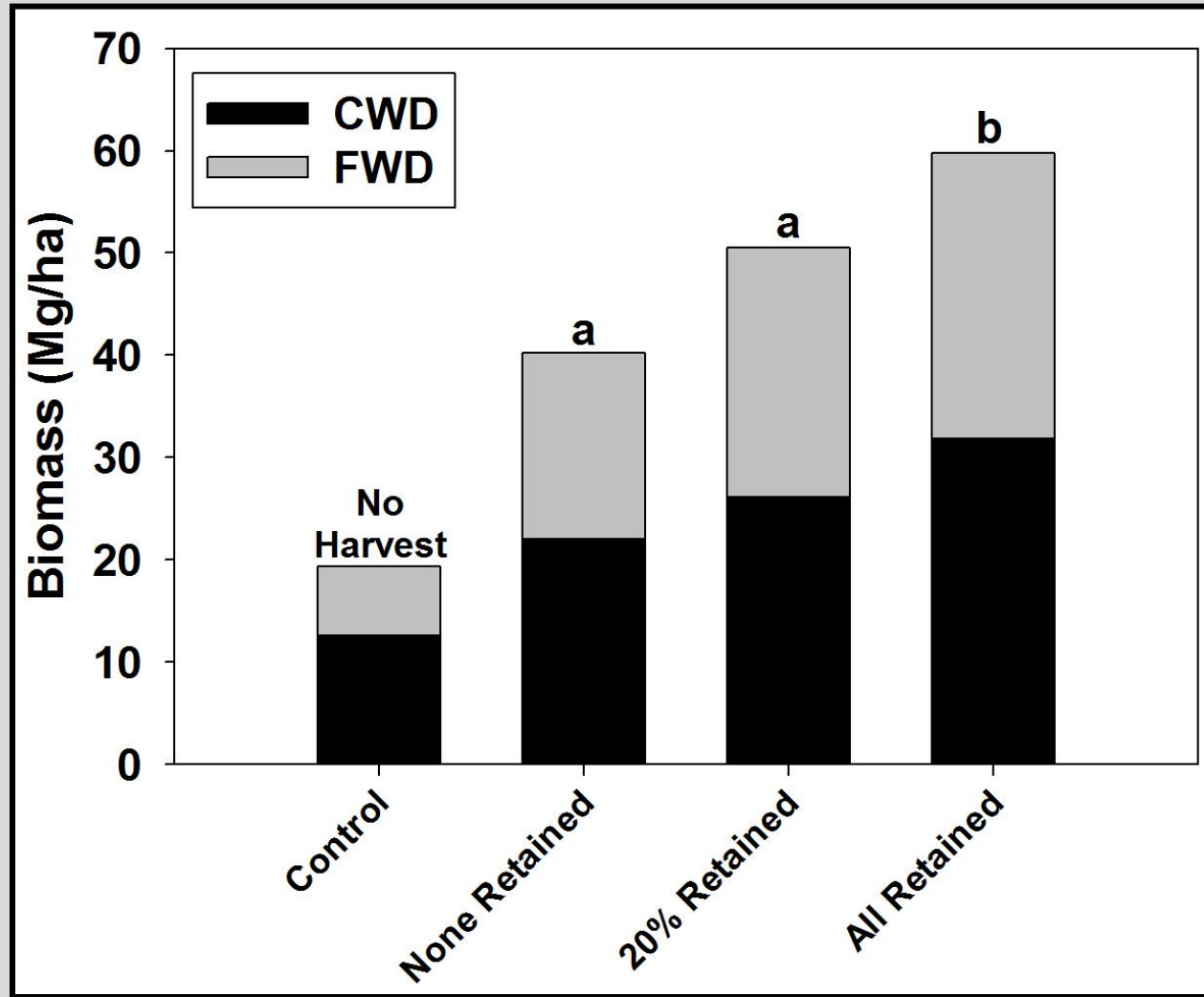


Dispersed retention



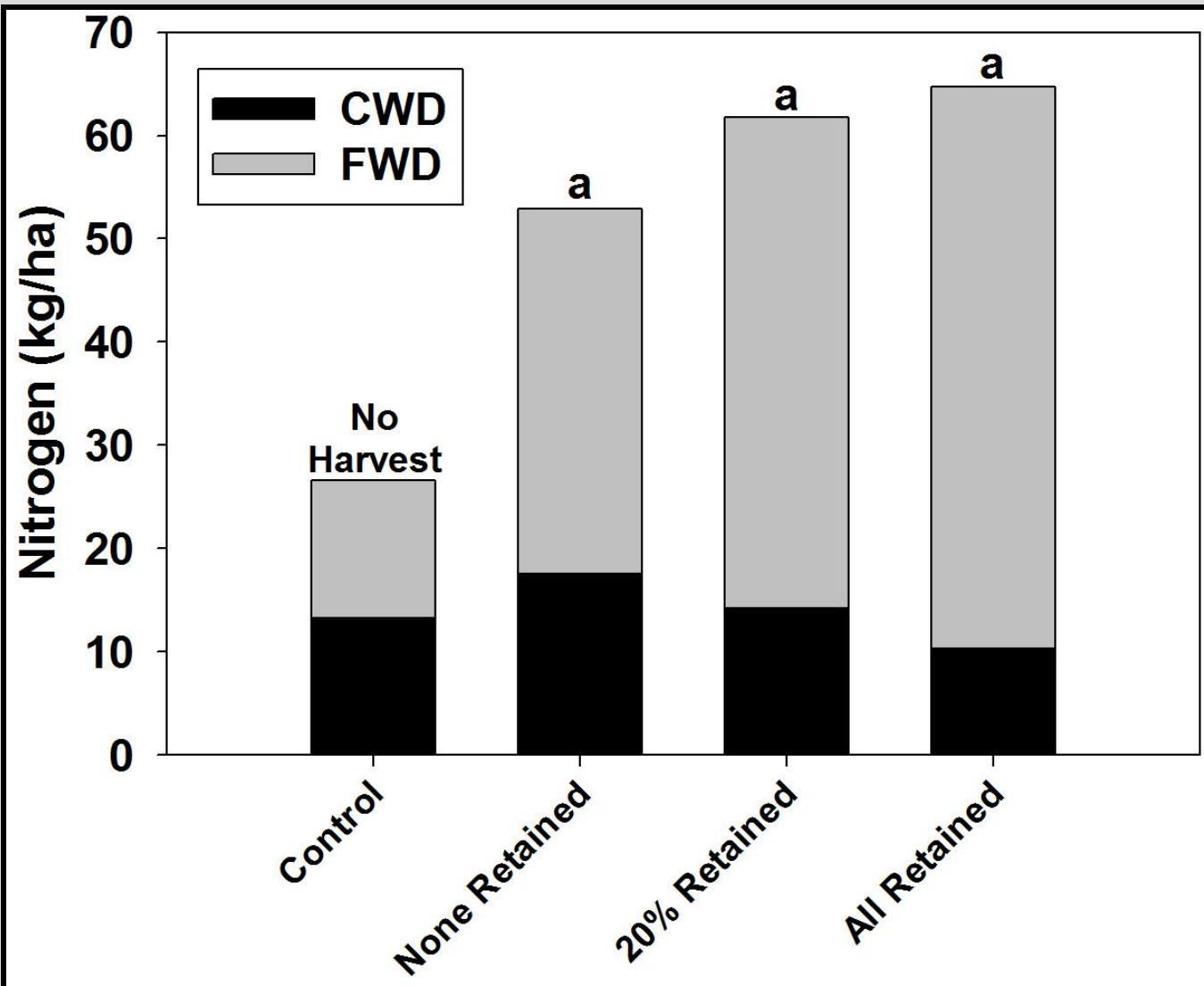
Leave-tree retention

Results: post-harvest slash levels

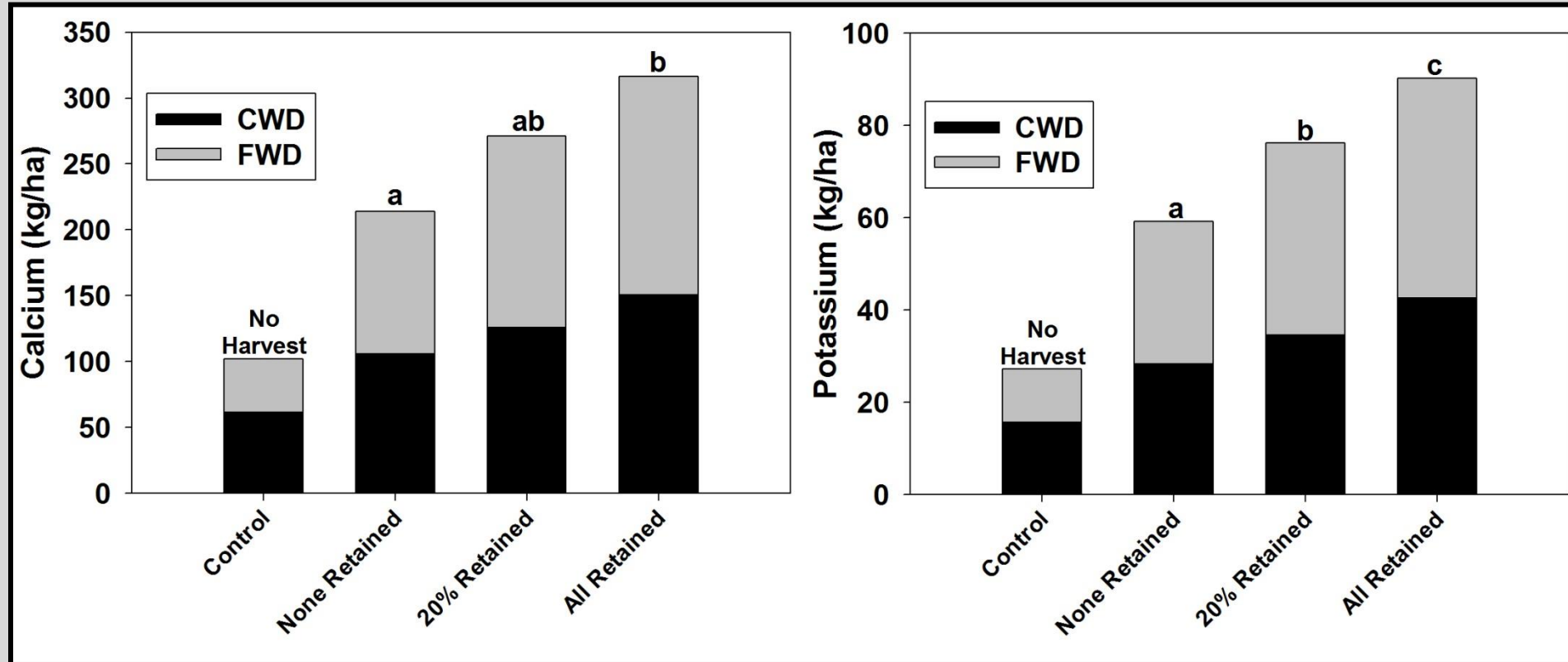


- No difference between no slash and 20% retention

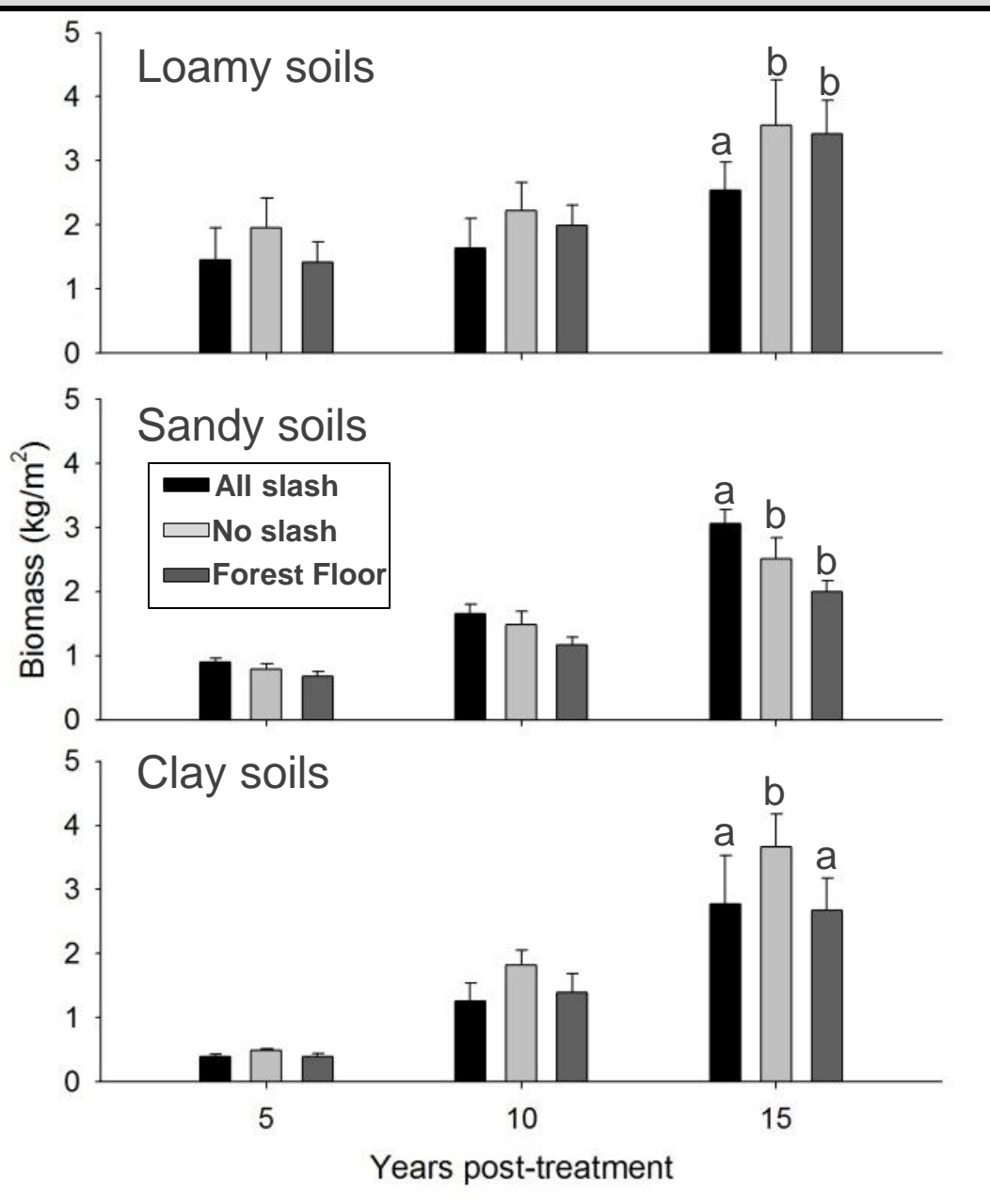
Results: post-harvest nutrients



Results: post-harvest nutrients



Results: long-term productivity



- Long-term trends in aspen productivity suggest slash removal impacts vary by soil type
 - +/-neutral on clay and loam soils
 - Negative on sandy soils



Results: saproxylic organisms

- Small mammals, amphibians, and reptiles



Photos: Chris Smith

Results: saproxylic organisms

- Small mammals, amphibians, and reptiles

Amphibians & Reptiles

American Toad, *Anaxyrus* [= *Bufo*] *americanus*
Wood Frog, *Lithobates* [= *Rana*] *sylvaticus*
Green Frog, *Lithobates* [= *Rana*] *clamitans*
Mink Frog, *Lithobates* [= *Rana*] *septentrionalis*
N. Leopard Frog, *Lithobates* [= *Rana*] *pipiens*
Spring Peeper, *Pseudacris crucifer*
Boreal Chorus Frog, *Pseudacris maculata*
Blue-spotted Salamander, *Ambystoma laterale*
Red-backed Salamander, *Plethodon cinereus*
Eastern Gartersnake, *Thamnophis sirtalis*
Red-bellied Snake, *Storeria occipitomaculata*

Mammals

Meadow Vole, *Microtus pennsylvanicus*
Masked/Pygmy Shrew, *Sorex cinereus/hoyi*
Water Shrew, *Sorex palustris*
Arctic Shrew, *Sorex arcticus*
Short-tailed Shrew, *Blarina brevicauda*
Star-nosed Mole, *Condylura cristata*
Southern Red-backed Vole, *Myodes gapperi*
Meadow Jumping Mouse, *Zapus hudsonius*
Woodland Jumping Mouse, *Napaeozapus insignis*
American Red Squirrel, *Tamiasciurus hudsonicus*

- Presence of small mammals, amphibians, and reptiles was related to harvested conditions versus slash levels
 - **Negative harvest effects**: American toad, wood frog, meadow vole, short-tailed shrew, meadow jumping mouse
 - **Positive harvest effects**: shrew species
- Long-term monitoring will critical for assessing role of slash and leave-trees in affecting these populations over time

Results: saproxylic organisms

- **Wood decay fungi**
- Total of 2,358 polyporoid fungi occurrences, representing 86 unique species were encountered
- Three species (*Funalia trogii*, *Pycnoporellus fulgens*, and *Skeletocutis chrysella*) have red-listed status in northern Europe as rare or threatened species.
- One additional species, *Rigidoporus crocatus*, is potentially rare in North America.
- Abundance of branches, particularly < 5 cm in diameter, most important to structuring communities



Conclusions & Recommendations

- Breakage during winter harvests resulted in little difference in slash loads or detrital nutrient pools in operational post-harvest conditions (i.e., no slash vs. 20% retention)
 - Guideline revisions that account for season of harvest and forest type



Conclusions & Recommendations

- Examination of long-term patterns in productivity underscore importance of accounting for differences in soil type and species
 - Guideline revisions that account for at risk soils and stand types (Possible linkages with NPCs to facilitate application)



Conclusions & Recommendations

- Initial results suggest general harvesting effects versus slash level impacts for small mammals and herp populations
 - Closer examination of leave-tree clumps will determine if these elements can “lifeboat” harvest sensitive species



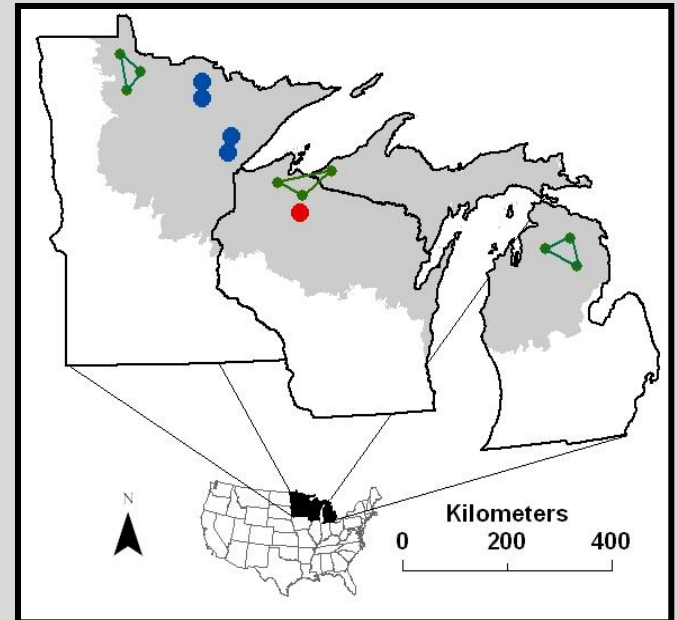
Conclusions & Recommendations

- Relationships between fine woody debris abundance and wood decay fungi communities highlight potential for negative impacts of high levels of slash utilization
 - Application of guidelines and/or winter harvesting within these systems may ameliorate impacts




Next Steps

- 2011-2013
 - Re-measure each site using USDA/DOE funding
 - Establish nutrient poor study sites through LCCMR funding
- 2013
 - Link findings from MFRC study sites with other regional studies of biomass impacts



Acknowledgements

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Questions?